

and clearing weather in the central valleys and Lake regions. The centre apparently passed from the upper Saint Lawrence Valley to the New England coast during the night of the 19th and then to the northeast of New England where the barometer fell .6 in eight hours.

VII.—The barometer was unusually low on the north Pacific coast during the afternoon of the 19th, while a high area and cold wave extended over the eastern slope of the Rocky Mountains. This low area moved eastward, and the isobars over the plateau regions indicated that low area number vii originated as a secondary disturbance over the central plateau region. It was first marked as in western Kansas on the morning of the 20th; from this section it advanced east and northeast, attended by general rains or snow. The barometer did not fall below 29.70 within this area, and the gradient was not rapid until it reached the Lake region. The strongest winds occurred when it was central in the lower lake region and immediately before it disappeared in the upper Saint Lawrence valley near Montreal, Province of Quebec.

VIII.—This disturbance originated as a secondary low area, and was first observed in the central Rocky Mountain region on the morning of the 21st. The principal disturbance, from which this and the preceding depression originated, remained west of the Rocky Mountains. The direction of movement was to the southeast during the first eight hours, and during the night of the 21st two low areas were observed, one central in Wisconsin and the other central in Indian Territory; the latter disappeared before the cold wave that followed the easterly movement of the former, which moved slowly over the upper lake region and then rapidly northeastward and disappeared over the Gulf of Saint Lawrence.

IX.—Previous to the appearance of this low area in the Southwest, a slight depression passed eastward from the northern Rocky Mountain region (and probably from the Pacific coast) over the Lake region, but its movements were not clearly defined and the depression was so slight that it has not been traced as a low area. Number ix became well defined as a low area central in southwestern Arkansas on the 26th, when a high area, attended by a cold wave, was central north of Manitoba. The barometer was about .3 above the normal for the month on the eastern slope of the Rocky Mountains, and a decided low area was advancing over the north Pacific. The cold air from the north apparently forced this depression to the eastward and caused it to disappear while central in eastern Tennessee, although succeeding reports indicate that a disturbance formed to the east of the south Atlantic coast immediately afterwards, and that this last-named disturbance followed the course of the Gulf Stream during the 28th and 29th, but the track of the storm could not be definitely given.

X.—This low area originated in the north Pacific and appeared as central near Olympia, Washington Territory, as a severe storm on the night of the 26th. The reports of the 27th and 28th indicate that this low area passed directly eastward, crossing the Rocky Mountains north of Montana, and gradually filling up as it approached the Lake region, where it disappeared without causing any change in the atmospheric condition of the eastern districts.

XI.—This low area was observed far to the north of Montana on the afternoon of the 29th, following the high area which had previously moved southwestward to the plateau regions. This area moved rapidly to the southeast during the 29th and 30th, following the Missouri Valley and crossing to the east of the Mississippi Valley as a well-defined low area, but it disappeared after reaching the Ohio Valley and could not be traced as a distinct depression after midnight of the 30th. The precipitation attending this depression was generally light, and the barometer fell as the depression moved to the southeast, the lowest reading being observed when the centre was near Indianapolis, Indiana. The disappearance of this depression within the limits of the stations of observation was probably due to the low area previously referred to as following the Gulf Stream. This storm was central near the New

England coast on the 30th, the barometer being below 29.40, and the outward flow of the upper air currents from this storm may have increased the supply of air over the low area to the west, thus causing it to disappear within the limits of the stations of observation.

NORTH ATLANTIC STORMS DURING JANUARY, 1886.

[Pressure expressed in inches and millimetres; wind-force by scale of 0-10.]

The tracks of the areas of low pressure that have appeared over the north Atlantic Ocean are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and special reports collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data, received at this office up to February 21, 1886.

The paths of seven areas of low pressure are shown on the chart for January, 1886. Of these, two, viz., numbers 5 and 6, are continuations of low areas which had previously passed over the United States and Canada; one, number 7, developed off the coast of Florida; number 1 appeared over the ocean in N. 46°, W. 40°; and the position of the remaining low areas, numbers 2, 3, and 4, are shown by a portion of their tracks in the northeast Atlantic near the coast of the British Isles.

The weather over the north Atlantic Ocean during January, 1886, was marked by frequent high winds and gales. The pressure over mid-ocean from the beginning of the month up to the 18th was generally high, while successive areas of low pressure took their course along the coasts of the United States and Canada, and also over the northeast Atlantic and the British Isles. From the 19th to the close of the month the pressure over mid-ocean and the European coast was comparatively low. Areas of high pressure occupied the ocean south of the Banks from the 19th to the 22d and from the 25th to the 28th.

The following are descriptions of the low areas charted:

1.—This area of low pressure first became well defined on the 2d, when the centre was near N. 46°, W. 40°, and the pressure, as reported by the s. s. "Schiedam," 29.74 (755.4); it had probably existed as a depression on the preceding day farther to the southward. This area moved eastward, and on the 3d its position is indicated by rains between N. 40° and 49° and W. 25° and 30°.

2.—This area of low pressure originated in high latitudes off the northeast coast of Europe, causing strong nw. gales over the northern portion of the British Isles on the 2d, accompanied by falling barometer. On the 3d the s. s. "Ethiopia," John Wilson, commanding, in N. 54° 40', W. 19° 00', reported strong w. to wnw. gales and heavy sea. The s. s. "Stockholm City," K. Doyle, commanding, in N. 58° 45', W. 4° 00', had a furious storm from w. and terrific squalls, with high seas, on the 3d, continuing on the 4th, when the barometer fell to 29.15 (740.4). The s. s. "Prinz Leopold," Wm. Rubarth, commanding, experienced a whole gale, setting in from the sw. on the 3d and continuing on the 4th, with falling barometer; in N. 59° 57', W. 5° 59', on the 4th, the barometer read 28.85 (732.8). This area moved steadily southward until on the 5th its approximate latitude is indicated on the chart at N. 54° and on the 6th at N. 50°, but without the necessary data from the land stations to determine with reliability the longitude of its path.

3.—This low area appeared off the west coast of Ireland on the 10th, and by the 11th had apparently moved eastward over Great Britain, as indicated by the following reports: The s. s. "Norseman," E. Maddox, commanding, in N. 50° 39', W. 8° 37', reported a fresh nw. to nne. gale and heavy squall on the 10th. The s. s. "Geiser," C. W. Möller, commanding, in N. 59° 10', E. 0° 42', had fresh gales with force 5 from se. on the 10th, veering to wsw. on the 11th and increasing to a force of 7, while the barometer fell to 28.95 (735.3). The s. s. "Durham

City," M. P. Lund, commanding, in N. 49° 45', W. 9° 59', had a strong gale from the w. and nw. on the 11th.

4.—This area of low pressure appeared off the northeast coast of the British Isles on the 16th, producing violent westerly gales, with a force of 7 to 8, over the British Isles, and over the ocean to the westward as far as W. 30°; the lowest reported barometer, at noon, Greenwich time, being 29.02 (737.1), in N. 58° 36', W. 8° 20'. The s. s. "Istrian," R. Leask, commanding, in N. 51°, W. 11° 30', had strong nw. gale, with high seas, on the 16th, continuing on the 17th, with increasing violence and falling barometer; the lowest reading of the barometer was 29.35 (745.5), in N. 50° 30', W. 15°, on the 17th. The s. s. "Assyrian Monarch," John Harrison, commanding, in N. 50°, W. 13° 20', reported a whole gale on the 16th, setting in from the nw., with barometer falling to 29.60 (751.8), on the 17th, in N. 49° 30', W. 16° 20'. Captain W. Rippeth, of the s. s. "Rialto," in N. 49° 20', W. 12° 34', reported barometer 29.40 (746.7), on the 17th, with the wind blowing a whole gale from the nw.

5.—This was a continuation of the storm described as number v under "Areas of low pressure" in this REVIEW. On the 17th the centre was over the Gulf of Saint Lawrence, with pressure at about 29.30 (744.2). On the 18th it had moved eastward to about N. 45°, W. 55°, where the pressure at noon, Greenwich time, was 29.14 (740.1); the barometric readings increasing on the southwest to 29.65 in N. 41°, W. 60°. Vessels to the south of the low centre had sw. to nw. gales with a force of 8, and hard seas. On the 19th the lowest readings were shown near N. 50°, W. 38°, where they ranged from 29.60 (751.8) to 29.80 (756.9), ships to the west experiencing gales of force 7 to 8. The s. s. "Jan Breydel," H. Meyer, commanding, in N. 49° 22', W. 30° 40', had squalls and high seas, with barometer at 29.60 (751.8). On the 20th, in N. 51°, W. 26°, the barometer had fallen to 29.40 (746.7), and on the 21st the low area had reached W. 20°, whence it moved southeasterly beyond the range of reported observations, or became merged with area number 6. On the 21st, 4 a. m., the s. s. "Iowa," S. Walters, commanding, in N. 48° 38', W. 26° 6', had moderating northeasterly winds and barometer 29.62 (752.3).

6.—This area was probably a continuation of the storm described as number vi under "Areas of low pressure" in this REVIEW. On the 20th the area was central over the Gulf of Saint Lawrence, where the pressure was about 29.50 (749.3). From this point it moved rapidly eastward and on the 21st was central in N. 51°, W. 40°. On that date the s. s. "Rhaetia," F. Vogelgesang, commanding, in N. 49° 12', W. 42° 30', reported westerly to northwesterly gales, with a force of 9, and barometer at 29.61 (752.1), attended by heavy snow squalls and very high westerly sea. The course of the low area then bent to the southeast and at noon of the 22d the s. s. "Iowa" had a fresh gale from the nw., with barometer at 29.42 (747.3), in N. 47° 12', W. 31° 41'; neighboring vessels had heavy squalls and high confused sea. The s. s. "St. Simon," E. Durand, commanding, in N. 46° 29', W. 33° 49', reported barometer 29.26 (743.2) at midnight of the 22d, and nw. wind, with force of 8. The s. s. "Rialto," in N. 47° 45', W. 29° 16', had light se. wind at 11 a. m., 22d, suddenly veering to nw. and increasing to a storm (force 9) at 3.30 p. m. During the 23d and 24th the area of low pressure moved eastward, and by 7 a. m. of the latter date reached W. 10°. The s. s. "Sidonian," B. Jamieson, commanding, in N. 37° 28', W. 17° 27', on the 24th, reported: "Gale continued strong from sw. to nw., with heavy squalls and rain, ship rolling heavily; lowest barometer, 29.59 (751.6), at 4 a. m." On the 25th the storm-centre had apparently passed eastward beyond W. 6°, where the barometer had fallen to 29.23 (742.4), and northerly winds prevailed.

7.—This low area first became well defined on the 27th, when its centre was near N. 32°, W. 75°, but it had apparently existed on the 25th and 26th, as indicated by the following reports: Bark "Kongsbyrd," G. Michalsen, commanding, "in N. 32° 21', W. 74° 41', on January 25th, experienced a strong

gale beginning from e. and ese.; on 26th it increased to a whole gale, backing to nne. in N. 35°, W. 75°." Captain W. H. Bennett of the s. s. "Craighill," off Jupiter Inlet, Florida, on the 26th, had nw. gale, barometer 29.72 (754.9), and very heavy sea from n. This low area moved northeastward in a course approximately parallel to the coast and with increasing velocity. By the 30th it had reached N. 46° and thence passed beyond the region of observation. At 4.10 p. m. on that date the s. s. "Craighill," in N. 37° 42', W. 71° 44', had barometer 29.36 (745.7), with strong gale backing from wnw. to sw.

In addition to the gales connected with the above series of low areas charted over the north Atlantic, the ship reports contain accounts of numerous gales caused by areas of low pressure whose tracks have been within the coast lines of Europe and North America and beyond the region of observation on the sea. Among such, the most important, by reason of their violence and destructiveness, were the gales off the Atlantic coasts of the United States from the 8th to the 11th, during the passage of the extraordinary low area described as number iii in this REVIEW.

The following are a few of the vessel reports relative to this storm:

The s. s. "Britannic," H. Perry, commanding, in N. 40° 30', W. 71° 40', reports barometer reading 28.95 (735.3), on the 9th, with violent gale blowing from the e. and shifting to the sw. Captain Joseph Baxter, of the American bark "Ralph M. Hayward," in N. 39° 27', W. 72° 76', reports, "a perfect hurricane, with heavy seas, on the 9th." S. S. "Trinidad," W. J. Frazer, commanding, reports wind blowing in squalls, with hurricane force, from 8th to 10th, in N. 36°, W. 69° 30'.

The s. s. "Caracas," Captain W. M. Hopkins, commanding, reports a hurricane on the 9th while in N. 37° 10', W. 73° 59'; the wind, which at the beginning of the storm was east-southeast, shifted to west-northwest, and was accompanied by a tremendous high and confused sea.

The s. s. "Hylton Castle" (Br.), William Colvin, commanding, sprung a leak in the hurricane of January 8th, while in N. 41° 19', W. 72° 45'. The wind, northeast at the beginning of the storm, shifted very suddenly to the southwest. On the 11th all hands left the vessel, which went down shortly after, fifteen miles southeast of Fire Island.

On the 10th the s. s. "Ethiopia," in N. 44° 56', W. 54° 25', had a strong s. gale, high confused sea, and heavy south swell.

The s. s. "Lessing" reported on the 11th, "very strong gale from sse. to sw.; dangerous sea and heavy rain-squalls."

The following are a portion of the wrecks reported during this storm:

Schooner "Juliet" was driven on the rocks near Deer Island, and the captain, mate, and cook were drowned.

Schooner "Clio Chilcott" went ashore in Block Island Sound; one man lost.

Schooner "Millie Trim," Olsen, went ashore on Calf Island, and became a total wreck. All hands, except the captain, were drowned.

Schooners "James Riley," "Zingara," and "Joseph Allen" went ashore at Kedge's Straits.

Schooner "Crazy Jane" was wrecked on Robbin's Island.

Schooners "Sappho" and "Seven Brothers" were wrecked at Gardiner's Bay, Long Island.

Schooner "L. M. Quillin" sunk in Albemarle Sound.

From the 29th to the 31st, vessels off the English coast had gales due to an area of low pressure whose track was apparently beyond the limits of the chart. The s. s. "Chicago," J. W. Jones, commanding, in N. 49° 22', W. 9° 10', had a strong westerly gale, beginning on the 29th and continuing to the 31st, when the barometer, at 12 noon, had fallen to 29.66 (753.4).

The s. s. "Denmark," R. S. Rigby, commanding, in N. 49° 30' and W. 14° to 20°, from the 29th to the 31st, experienced strong westerly gales, violent squalls, and heavy rough sea, with barometer at 29.70 (754.4).

The s. s. "Milanese," in the English Channel, on the 30th, had strong wsw. gales and high seas, continuing with heavy squalls on the 31st.

OCEAN ICE.

The only icebergs reported during the month were on the southeast coast of Newfoundland, and their position is indicated on chart i by shaded spots. These are undoubtedly the same as those reported in December off the entrance to Saint John's Harbor.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during January, 1886, eleven reports concerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian; two message was sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for January, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for January.

Districts.	Average for Jan. Signal-Service ob- servations.		Comparison of Jan., 1886, with the average for several years.
	For sev- eral years.	For 1886.	
New England	25.5	24.8	- 0.7
Middle Atlantic States.....	33.3	30.0	- 3.3
South Atlantic States.....	40.7	40.8	- 5.9
Florida Peninsula.....	60.8	54.2	- 6.6
Eastern Gulf States.....	48.4	40.7	- 7.7
Western Gulf States.....	46.0	39.4	- 7.2
Rio Grande Valley.....	57.2	52.8	- 4.4
Tennessee.....	39.5	31.1	- 8.4
Ohio Valley.....	31.7	25.9	- 5.8
Lower Lake region.....	25.6	22.0	- 3.6
Upper Lake region.....	18.1	15.5	- 2.6
Extreme Northwest.....	2.4	4.1	- 6.5
Upper Mississippi Valley.....	22.8	15.7	- 7.1
Missouri Valley.....	17.3	6.8	- 10.5
Northern slope.....	17.7	10.4	- 7.3
Middle slope.....	24.9	19.3	- 5.6
Southern slope.....	39.4	35.0	- 4.4
Southern plateau.....	40.4	41.0	+ 0.6
Middle plateau.....	29.0	30.7	+ 1.7
Northern plateau.....	25.8	25.3	- 0.5
North Pacific coast region.....	39.3	38.0	- 1.3
Middle Pacific coast region.....	47.5	47.7	+ 0.2
South Pacific coast region.....	53.1	54.9	+ 1.8

In the Canadian Maritime Provinces, northern New England, California, and over the western portions of the middle and southern plateau districts, the monthly mean temperatures were above the normal, the departures being greatest in the Canadian Maritime Provinces, where they were from 4° to 6°; over the plateau districts and California the departures were below 3°. In all other districts the mean temperatures were below the normal, the departures ranging from 4° to 10° over the greater part of the country to the eastward of the Rocky Mountains. The district showing the greatest departure below the normal temperature is the Missouri Valley, where the average (four stations) is 10°.5; over the northern slope, Tennessee, and the Gulf States the average departures ranged from 7° to 2°, in the west Gulf states, to 8° to 4°, in Tennessee. In the Atlantic coast districts the average departures below the normal temperature increased from less than 1° in New England to 3°.

in the middle Atlantic states, 5° to 9° in the south Atlantic states, and to 6° to 6° in Florida. Over the middle and southern Rocky Mountain slopes and Rio Grande Valley the temperature averaged about 5° below the normal.

The following are some of the most marked departures reported from Signal Service stations:

Above normal.		Below normal.	
Mount Washington, New Hampshire.....	6.4	Omaha, Nebraska.....	13.1
Sydney, Nova Scotia.....	6.4	Little Rock, Arkansas.....	12.5
Charlottetown, Prince Edward Island.....	5.7	Leavenworth, Kansas.....	11.2
Halifax, Nova Scotia.....	5.6	Memphis, Tennessee.....	10.8
Frederickton, New Brunswick.....	4.5	Fort Assinaboine, Montana.....	10.4
Eastport, Maine.....	3.3	Poplar River, Montana.....	10.1
Winnemucca, Nevada.....	2.9	Calro, Illinois.....	9.7
Prescott, Arizona.....	2.8	Vicksburg, Mississippi.....	9.6
Los Angeles, California.....	2.1	Nashville, Tennessee.....	9.5

RANGES OF TEMPERATURE.

The monthly, and the greatest and least monthly ranges of temperature, are given in the tables of miscellaneous meteorological data.

The following are some of the greatest and least monthly ranges:

Greatest.		Least.	
Fort Benton, Montana.....	100.1	San Francisco, California.....	26.5
Fort Assinaboine, Montana.....	95.4	Cape Mendocino, California.....	27.4
Fort Buford, Dakota.....	92.3	Fort Canby, Washington Territory.....	30.5
Helena, Montana.....	91.9	Tatoosh Island, Washington Territory.....	32.0
Poplar River, Montana.....	90.1	Pyah, Washington Territory.....	32.0
Valentine, Nebraska.....	87.1	Red Bluff, California.....	34.5
Fort Maginnis, Montana.....	82.9	Sacramento, California.....	34.7
Denver, Colorado.....	81.7	Astoria, Oregon.....	35.0

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for January for a series of years, the mean temperature for January, 1886, and the departures from the normal:

Station.	County.	Normal tem- perature for January.	Number of years.	Mean tem- perature for Jan., 1886.	Departure.
Arkansas.					
Lead Hill.....	Boone.....	29.6	4	24.2	- 5.4
California.					
Princeton.....	Colusa.....	45.8	14	47.7	+ 1.9
Sacramento.....	Sacramento.....	45.4	20	46.6	+ 1.2
Connecticut.					
Hartford.....	Hartford.....	23.4	2	23.4	0.0
Middletown.....	Middlesex.....	24.9	28	22.9	- 2.0
New Haven.....	New Haven.....	26.7	100	25.3	- 1.4
New London.....	New London.....	28.2	16	27.8	- 0.4
Dakota.					
Webster.....	Day.....	1.8	3	0.0	- 1.8
Illinois.					
Anna.....	Union.....	32.5	11	24.3	- 8.2
Mattoon.....	Coles.....	25.3	6	21.5	- 3.8
Riley.....	McHenry.....	17.2	23	14.4	- 2.8
Swanwick.....	Perry.....	25.1	4	22.1	- 3.0
Indiana.					
Lafayette.....	Tippecanoe.....	23.2	7	19.1	- 4.1
Logansport.....	Cass.....	26.2	31	22.7	- 3.5
Mauzy.....	Rush.....	21.0	6	19.2	- 1.8
Spice land.....	Henry.....	26.0	32	21.9	- 4.1
Vevay.....	Switzerland.....	31.4	21	27.5	- 4.1
Iowa.					
Creco.....	Howard.....	10.1	10	4.5	- 5.6
Monticello.....	Jones.....	15.4	32	9.8	- 5.6
Muscatine.....	Muscatine.....	19.3	46	14.2	- 5.1
Kansas.					
Fort Scott.....	Bourbon.....	25.8	7	21.2	- 4.6
Independence.....	Montgomery.....	27.7	14	18.6	- 9.1
Wellington.....	Sumner.....	25.0	8	17.6	- 7.4
Yates Centre.....	Woodson.....	23.2	6	15.8	- 7.4
Maine.					
Belfast.....	Waldo.....	18.9	27	20.8	+ 1.9
Bridgeton.....	Somerset.....	17.3	11	18.9	+ 1.6
Eastport.....	Washington.....	19.8	13	22.9	+ 3.1
Gardiner.....	Kennebec.....	17.8	50	19.4	+ 1.6
Orono.....	Penobscot.....	15.4	18	18.0	+ 2.6
Maryland.					
Fallston.....	Harford.....	29.9	15	26.6	- 3.3
Massachusetts.					
Amherst.....	Hampshire.....	23.3	49	23.7	+ 0.4
Cambridge.....	Middlesex.....	24.9	64	24.2	- 0.7
Fitchburg.....	Worcester.....	22.3	29	21.7	- 0.6
Lowell.....	Middlesex.....	23.8	10	23.9	+ 0.1
New Bedford.....	Bristol.....	28.3	74	27.2	- 1.1
Somerset.....	Bristol.....	26.2	16	26.5	+ 0.4